UNIVERSITI TEKNOLOGI MARA

NOISY IRIS RECOGNITION SYSTEM USING MODIFIED CIRCULAR HOUGH TRANSFORM (MCHT) AND ENHANCED DARKNET19

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ABSTRACT

Noisy iris images containing occlusions from eyelids, eyelashes, hair, glasses, and illumination variations introduce significant challenges to iris recognition systems, particularly in accurate iris boundary segmentation and robust feature extraction. Conventional Circular Hough Transform (CHT) based segmentation methods are highly sensitive to noise and false edge detection, resulting in inaccurate localization of iris boundaries in non-ideal images. In addition, existing deep learning networks (DLNs) for iris recognition exhibit degraded performance when applied to noisy iris images, as they are unable to effectively select and extract discriminative features, leading to low recognition accuracy even for genuine subjects. To address these limitations, this study proposed a new iris recognition system based on Modified Circular Hough Transform (MCHT) and enhanced Darknet19. The proposed MCHT improved iris boundary localization by reducing false circle detection in noisy conditions, thereby minimizing segmentation errors. Furthermore, the enhanced Darknet19 incorporated an improved feature extraction mechanism to better preserve discriminative iris texture information under noisy environments. Experiments were conducted using noisy iris datasets, namely CASIA-Iris-Thousand and CASIA-Iris-Lamp. The experimental results on the CASIA-Iris-Thousand and CASIA-Iris-Lamp datasets demonstrated that the proposed MCHT achieved segmentation accuracies of 97.02% and 95.44%, respectively, significantly outperforming the conventional CHT method, which achieved 73.38% and 52.62%. In terms of recognition performance, the Enhanced Darknet19 achieved a recognition accuracy of 70.05% on the CASIA-Iris-Thousand dataset and 64.88% on the CASIA-Iris-Lamp dataset, compared to 52.03% and 39.27%, respectively, obtained using the baseline Darknet19 model. These results confirm the effectiveness of the proposed method for an improved iris recognition system.

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CHAPTER 1
INTRODUCTION

1.1 Research Background

Biometric authentication system is a system which automatically authenticates a person based on his/her physiological or behaviour characteristics. It has witnessed a large-scale deployment in a wide range of security applications. It has already been deployed to protect personal computers, credit cards, Banking machines, airports, electronic transactions, high security institutions like nuclear facilities, Military Bases and other applications like borders control, access control, sensitive data protection and on-line tracking systems (Misini & Lajçi, 2022). Fingerprint scanning, voice authentication, face recognition, hand geometry authentication and iris recognition are type of biometric authentication technologies available today as shown in Figure 1.1.

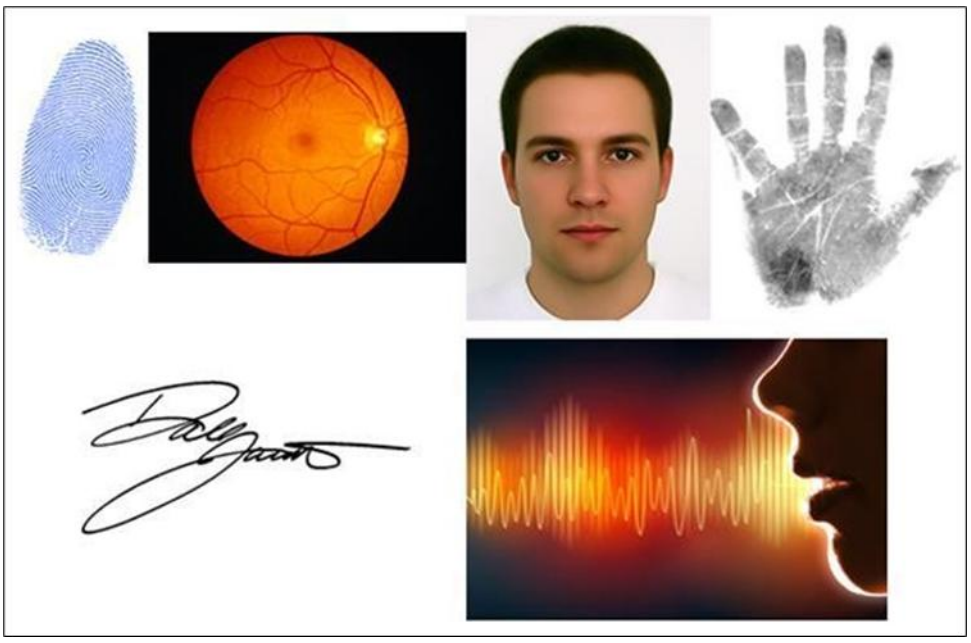

Figure 1.1 Examples of Biometrics Traits

Among the available biometric modalities, iris is one of the most promising and widely adopted modalities. It is mainly due to the high recognition accuracy it can provide, and to the ease with which it can be acquired (Maiorana et al., 2014). The characteristics of iris which are stable, unique, flexible, reliable and non- invasive give a better authentication in iris recognition system (Concas et al., 2023). Iris recognition